What is claimed is:

1. A method of polishing a substrate surface having at least one feature thereon comprising ruthenium and at least one dielectric material, comprising:

providing an aqueous composition comprising from about 0.0005 to about 1 moles / kilogram of periodic acid and from about 0.2% to about 6% % by weight of silica abrasive having an average particle size of about 50 nm or less, wherein the aqueous composition is disposed between a polishing pad and the substrate; and

moving the polishing pad relative to the substrate surface, where the removal rate of the ruthenium is at least 300 A/min.

2. A method of polishing a substrate surface having at least one feature thereon comprising ruthenium and at least one layer comprising a low-K dielectric, comprising:

contacting the substrate with a silica abrasive and with an aqueous composition comprising periodic acid and a quaternary amine, wherein the solution has a pH of about 2.5 to about 5; and

chemically mechanically polishing the substrate to remove a portion of the ruthenium, wherein the removal selectivity of the ruthenium to the low-K dielectric is greater than 20:1.

3. A method of polishing a substrate surface having at least one feature thereon comprising ruthenium and at least one feature comprising tantalum oxide, comprising:

providing an aqueous composition comprising from about 0.1% to about 3% by weight periodic acid, from about 0.2% to about 6% % by weight of silica abrasive having an average particle size of about 50 nm or less, wherein the aqueous composition is provided between a polishing pad and the substrate, and wherein the composition comprises less than about 0.5% of sources of chloride ions; and

moving the polishing pad relative to the substrate surface, where the polishing rate of tantalum oxide is between about 0.8 and 1.7 times the polishing rate of ruthenium.

4. A method of polishing a substrate surface having at least one feature thereon comprising a noble metal, comprising

providing an aqueous periodic acid solution having 0.0005 to about 1 moles / kilogram of periodic acid;

adjusting the pH of the aqueous periodic acid to a pH of between about 3 and about 7 with a quaternary amine;

adding from about 0.2% to about 6% % by weight of silica abrasive having an average particle size of about 50 nm or less to the pH-adjusted aqueous composition to form a polishing slurry; and

contacting the substrate with the polishing slurry.

5. The method of any of claims 1 to 4, wherein the substrate comprises a ruthenium feature and at least one of PETEOS dielectric, TEOS dielectric, or BSPG dielectric, and wherein the removal selectivity of the ruthenium to the dielectric is greater than about 20:1.

6. The method of any of claims 1 to 5, wherein the composition comprises less than about 0.1% of sources of chloride ions.

7. The method of any of claims 1 to 6, wherein the silica abrasive is present in an amount between about 0.2% to about 4% by weight and the periodic acid is present in an amount from about 0.01 to about 0.05 moles/kilogram of aqueous composition.

8. The method of any of claims 1 to 7, wherein the silica abrasive is substantially spherical silica particles with a particle size of about 4 nanometers to about 25 nanometers.

9. The method of any of claims 1 to 8, wherein the silica abrasive is present in an amount between about 0.2% to about 1% by weight and the periodic acid is present in an amount from about 0.01 to about 0.05 moles/kilogram of fluid.

10. The method of any of claims 1 or 3 to 9, wherein the aqueous composition further comprises an amine in an amount sufficient to adjust the pH to between about 3 and about 7.

11. The method of any of claims 1 to 10, wherein at least 50% of the weight of the silica should be in a chain-like structure with a length-to-width ratio of at least 4.

12. The method of any of claims 1 to 10, wherein at least 50% of the weight of the silica should be in a aggregate with an aggregate diameter of about 03 to 0.05 microns before polishing.

13. The method of any of claims 1 to 10, wherein the silica abrasive comprises both silica particles in a chain-like structure with a length-to-width ratio of at least 4, and also silica particles in aggregates with an aggregate diameter of about 03 to 0.05 microns, and wherein before polishing at least 70% of the weight of the silica is contained in the chain-like structures and the aggregates.

14. The method of any of claims 1 to 13, wherein the substrate further comprises a hard-mask material, and wherein the polishing rate the polishing rate of the hardmask material is equal to or greater than the polishing rate of the ruthenium.

15. The method of any of claims 1 to 14, wherein the substrate comprises at least one of tantalum oxide or titanium oxide, and wherein the polishing rate of the tantalum oxide and/or titanium oxide is between about 0.9 and 1.3 times the polishing rate of ruthenium.

16. The method of any of claims 1 to 15, wherein the pH of the aqueous composition is between about 3 and about 4.

17. The method of any of claims 1 to 16, wherein the aqueous composition consists essentially of water, periodic acid, one or more quaternary amines, and the silica abrasive, and wherein the solution has a pH of about 2 to about 5;

18. The method of any of claims 1 to 17, wherein the polishing process is a one-step process, and the polishing rate of ruthenium is greater than 500 angstroms per minite.

19. The method of any of claims 1 to 18, wherein the composition is free of sources of chloride ions.

20. The method of any of claims 1 to 19, wherein the composition comprises from about 0.3% to 0.7% by weight of periodic acid.